Dioxin Fingerprinting in the HSC

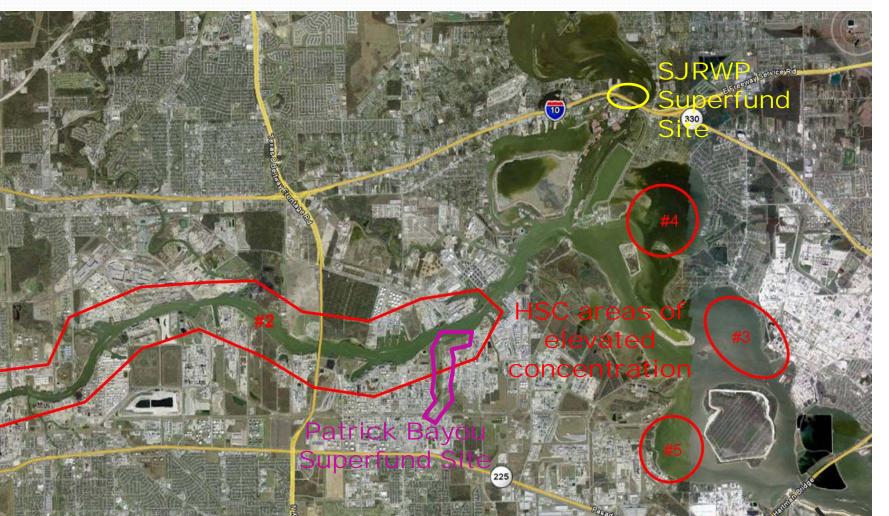
Linda Broach, TCEQ Philip Turner, EPA R6 Jan 2012

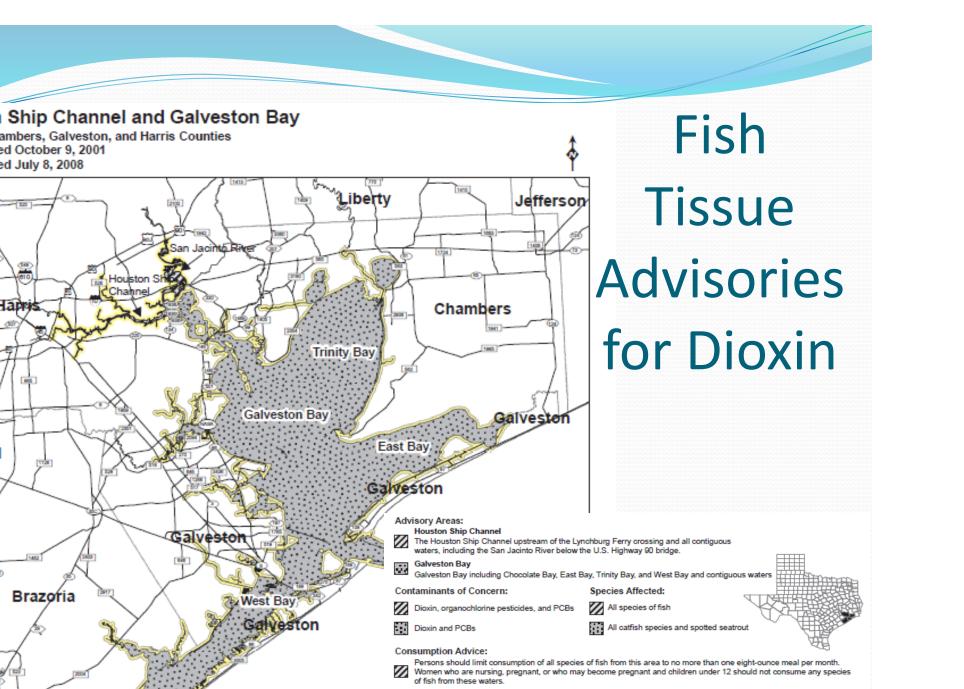
bjectives

Compare dioxin fingerprints from several areas of the HSC to the SJRWP superfund site:

- Patrick Bayou superfund site
- HSC from Sims Bayou to Tucker Bayou
- Burnett Bay
- Scott Bay
- San Jacinto Bay
- Galveston Bay along the HSC

reas of Interest for this project:

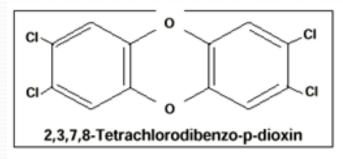


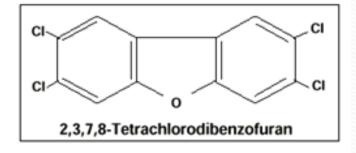


1ethods

- Used Surface Sediment data from SJRWP site geodatabase, Patrick Bayou site database, and EPA Marine and Coastal Studies report
- Used 2 upstream stations in the SJR as background 11200 and 16622
- Plotted highest 12 samples from inside SJRWP to describe pit "fingerprint"
- All values given are station averages, if more than one sample was available for a site
- TEQs computed using WHO TEFs with ND=o
- Fingerprint is computed by dividing each congener by the total for all 2,3,7,8 dioxin and furan congeners except OCDD, which was omitted for clarity

ioxins and Furans . . .



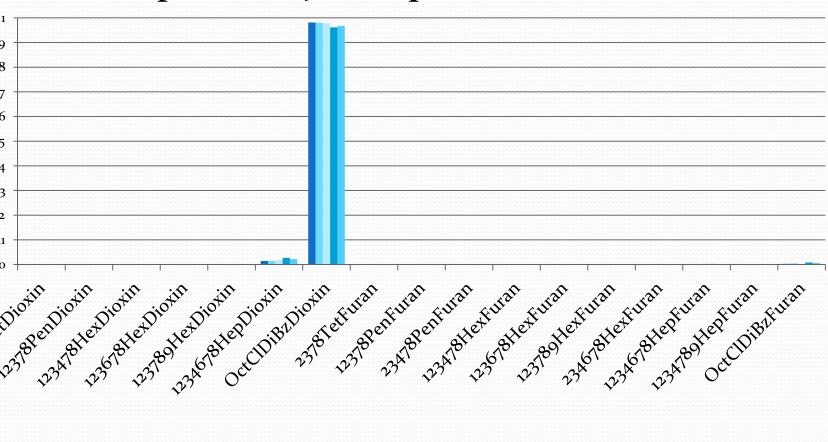


TOXIC EQUIVALENCY FACTORS (TEFs)

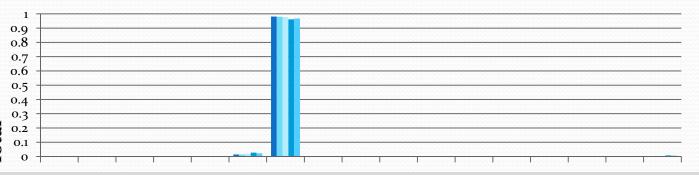
	TEF
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	1
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	0.01
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	0.0003
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.1
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.03
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.3
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	0.01
1.2.3.4.7.8.9-Heptachlorodibenzofuran (HpCDF)	0.01

CONGENER FINGERPRINT

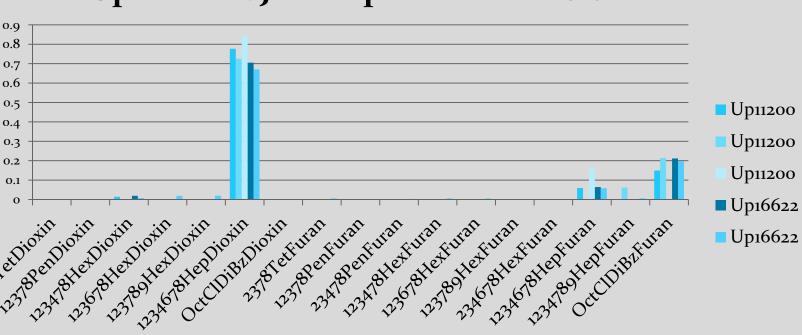
Upstream SJR samples with OCDD



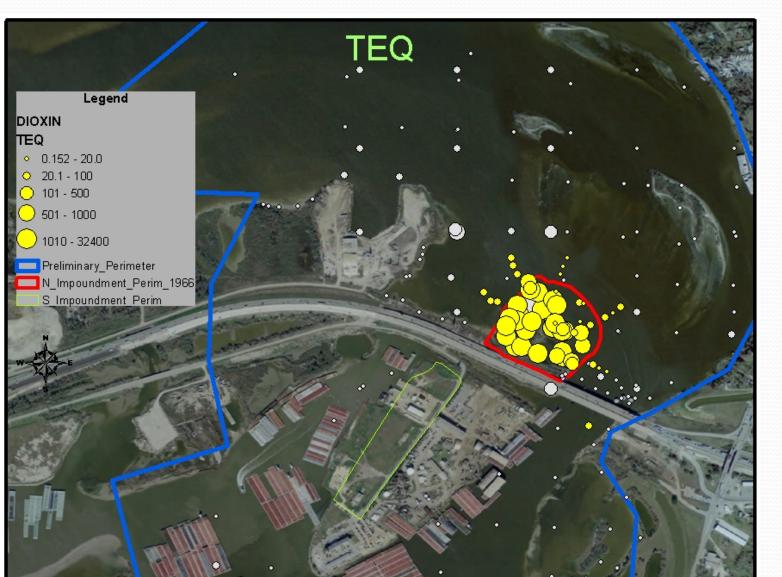




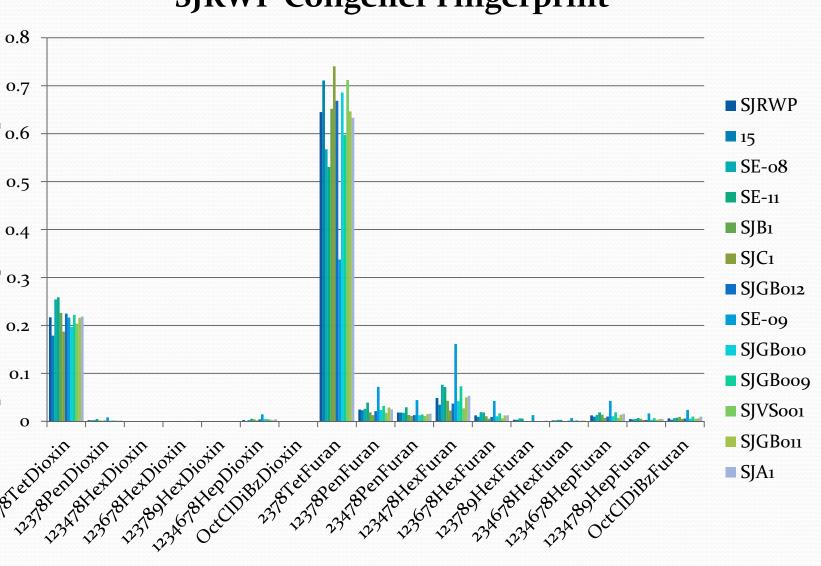
Upstream SJR samples without OCDD



EQ in SJRWP area







bservations - SJRWP

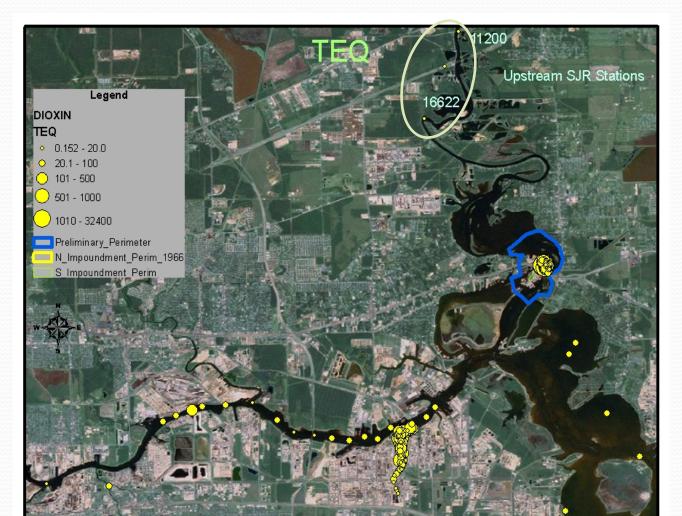
SJRW Pits are not homogenous

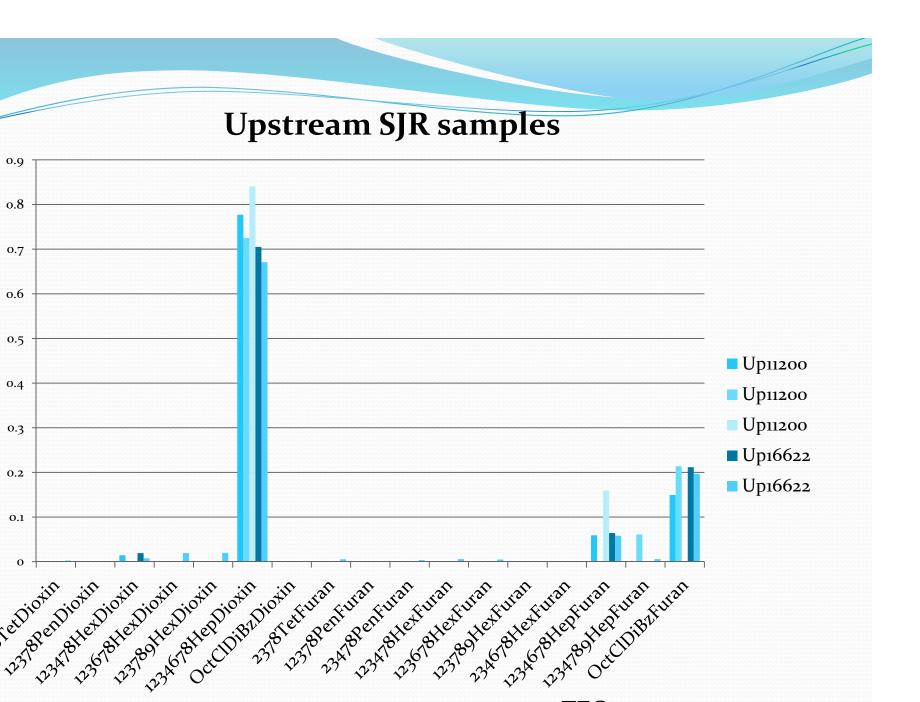
Clear evidence of deposition from other sources and "clean" mud

Congener fingerprint is dominated by

- 2378 Tetra-furan (TCDF),
- 2378 Tetra-dioxin (TCDD),
- and smaller amounts of other furans

pstream Station Locations



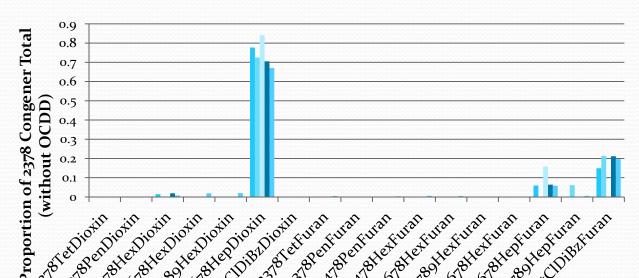


pstream SJR

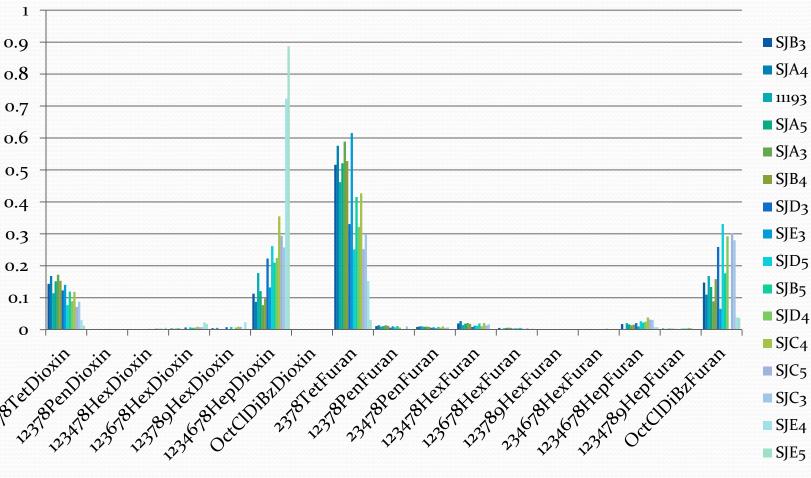
Jpstream (background) fingerprint dominated by

- 1234678 HpCDD,
- OCDF,
- 1234678 HpCDF,
- 1234789 HpCDF

Upstream SJR samples



Congener Fingerprint for Samples near the SJRWP



TFO range for these samples = 02 to 2 4 nnt

ear Pit samples

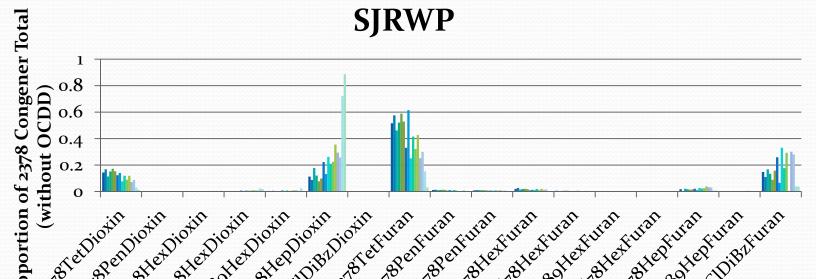
ear-pit fingerprints are similar to pits,

but with lots more HpCDDs and OCDFs

and less PeCDFs and HxCDFs

u can see the decline in %TCDF and %TCDD with the crease in %HpCDD

Congener Fingerprint for Samples near the **SJRWP**



atrick Bayou

60 stations

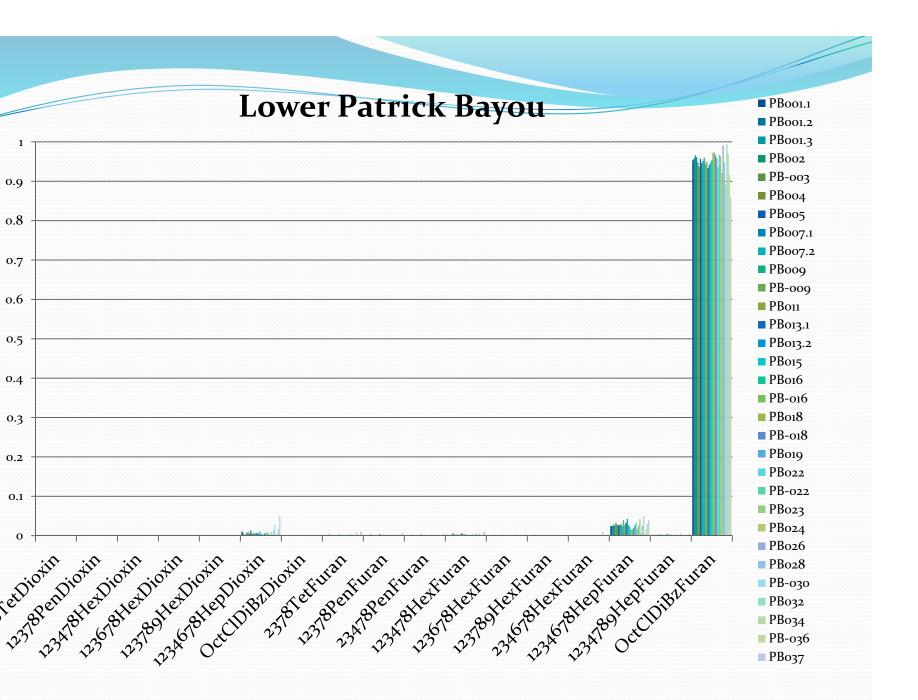
TEQ range: 0.2 to 2224 ppt

• Average TEQ = 133 ppt (Median = 73 ppt)

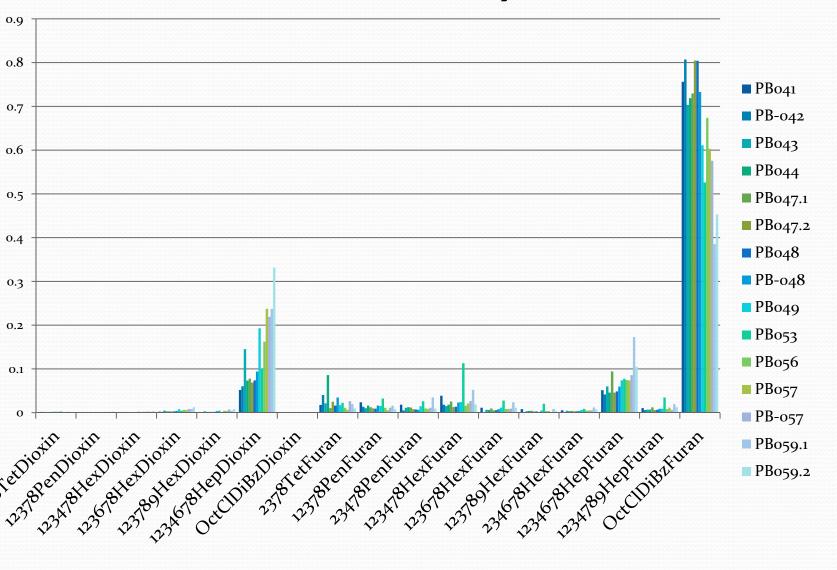
High OCDF in lower reach

Middle and upper reaches have various fingerprints

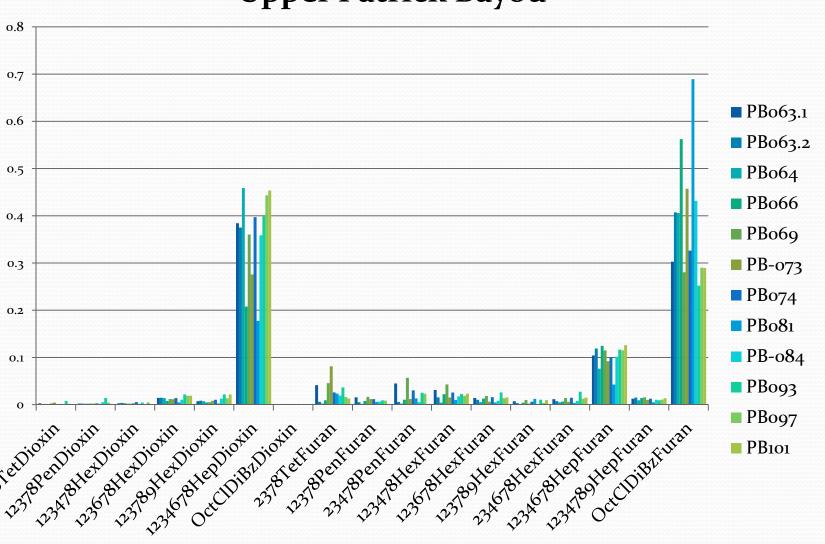








Upper Patrick Bayou



bservations – Patrick Bayou

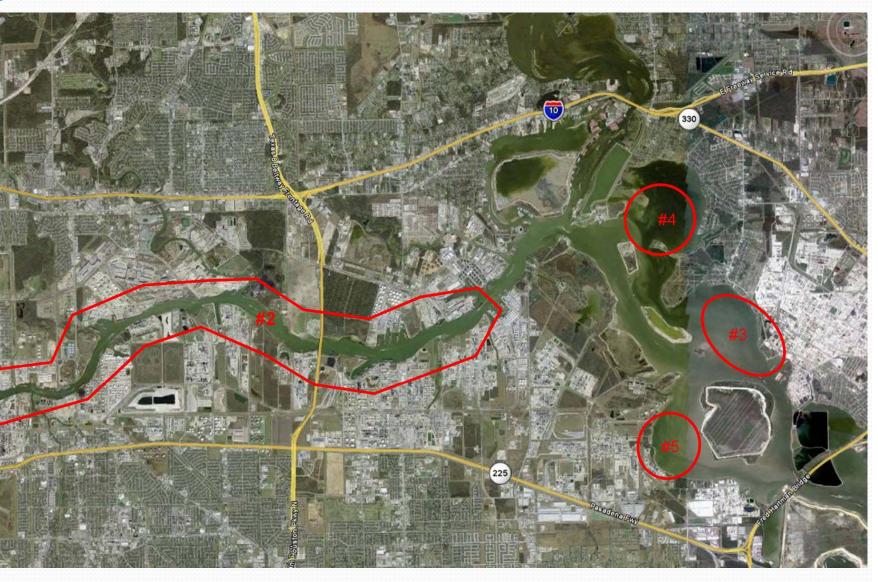
Patrick Bayou downstream fingerprint dominated by OCDF

Upstream fingerprint includes HpCDD and one of the HpCDFs, in addition to the OCDF

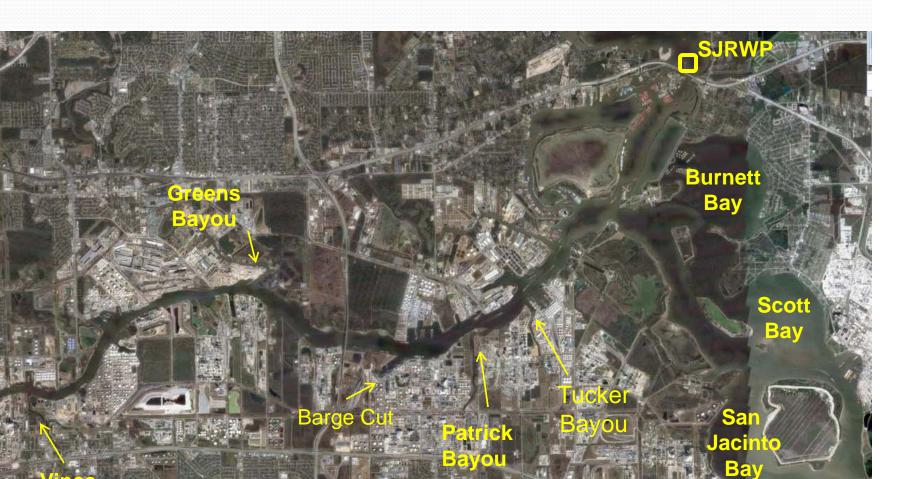
Cleaner signal downstream, and as move upstream (away from HSC) more congeners appear

In HSC, strong decrease in OCDFs away from Patrick Bayou

- areas of noted elevated concentrations

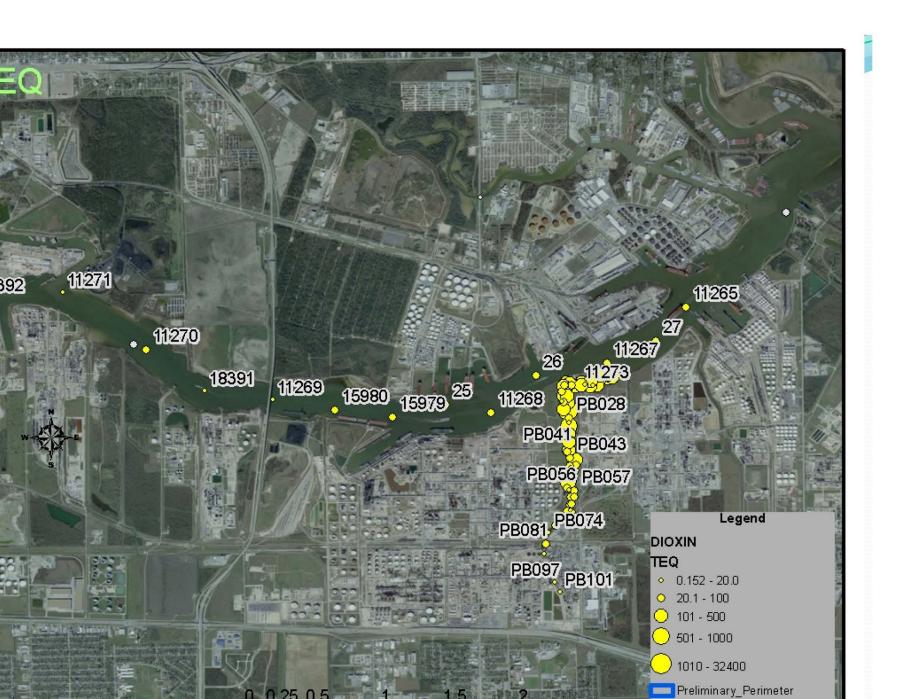


SC Tributaries and Side Bays

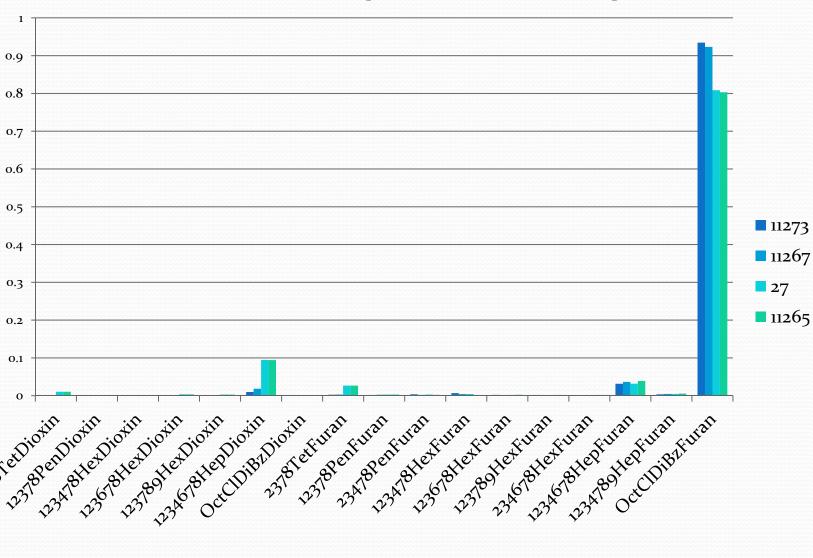


SC Tributaries and Side Bays

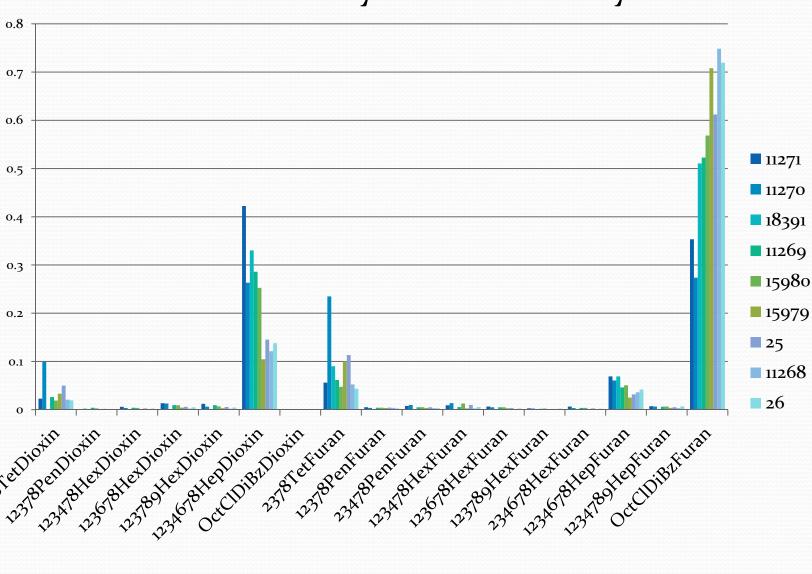


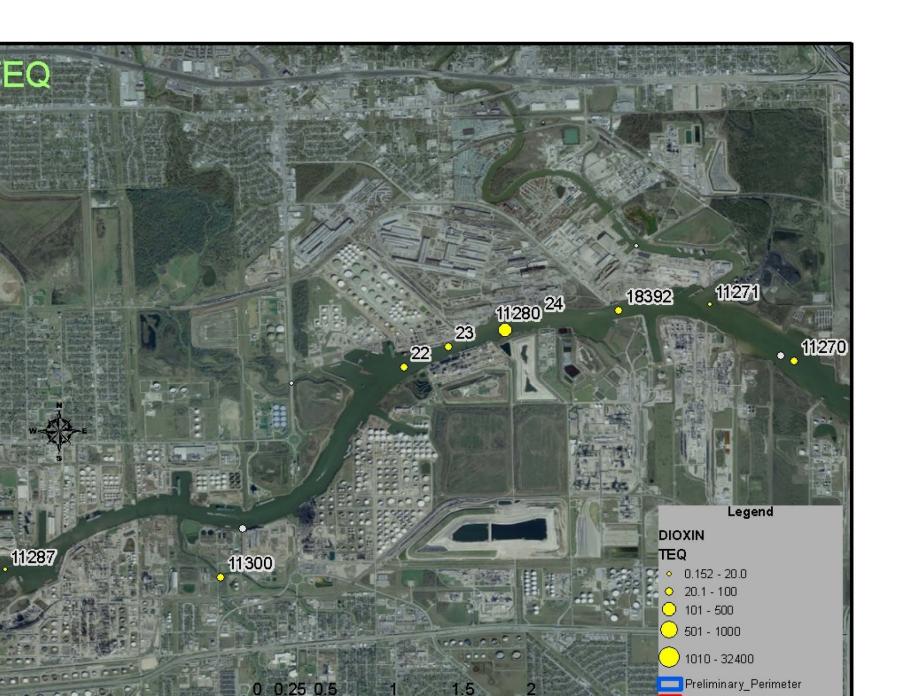


HSC - Patrick Bayou to Tucker Bayou

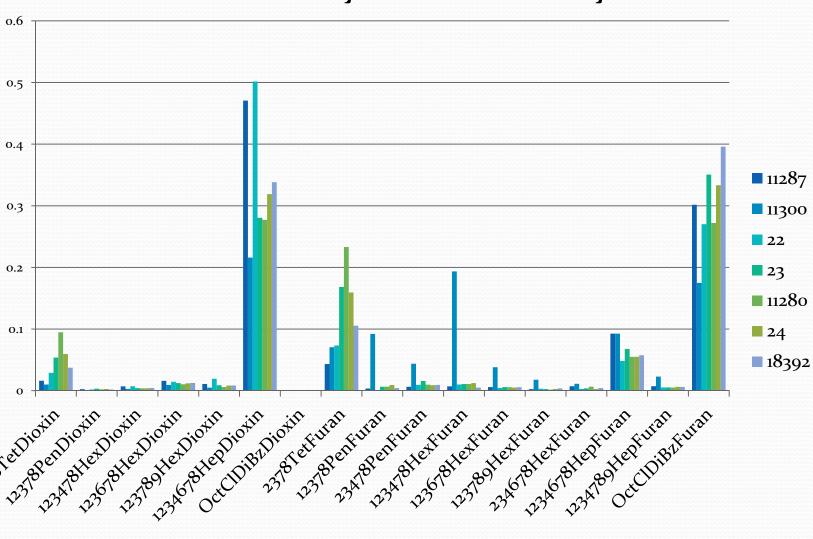


HSC - Greens Bayou to Patrick Bayou





HSC - Sims Bayou to Greens Bayou



pservations tellscher Bayou: Bugerpalm Bayout by OCDF

- some HpCDDs, TCDFs, and HpCDFs
- Greens Bayou to Patrick Bayou: fingerprint dominated by OCDF
- Some HpCDDs, more TCDFs, and HpCDFs
- Sims Bayou to Greens Bayou: fingerprint dominated by OCDF
- some HpCDDs, TCDFs, and HpCDFs
- Small amounts of numerous other congeners

SC Side Bays

All have similar fingerprints

Burnett Bay

- 16496, TEQ = 34 ppt
- 13344, TEQ = 29 ppt

Scott Bay

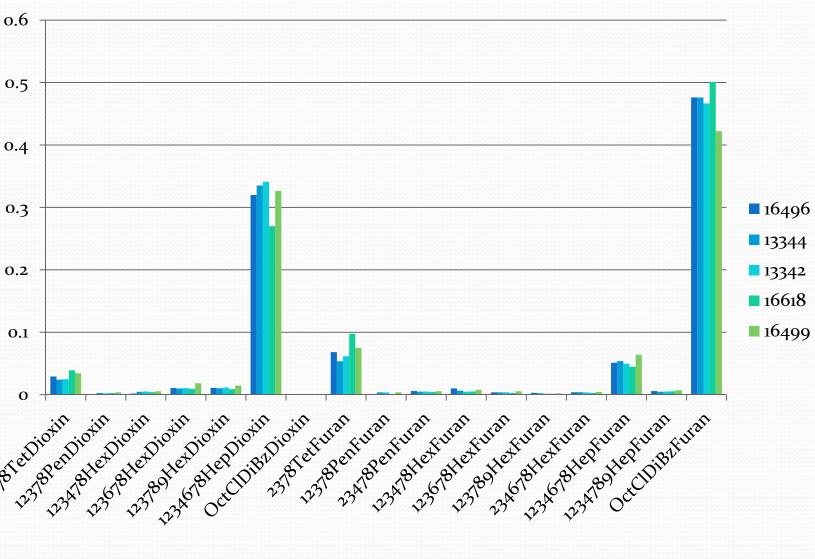
- 13342, TEQ = 29 ppt
- 16618, TEQ = 24 ppt

San Jacinto Bay

• 16499, TEQ = 21.6 ppt



HSC Side Bay Congener Fingerprint



bservations – HSC Side Bays

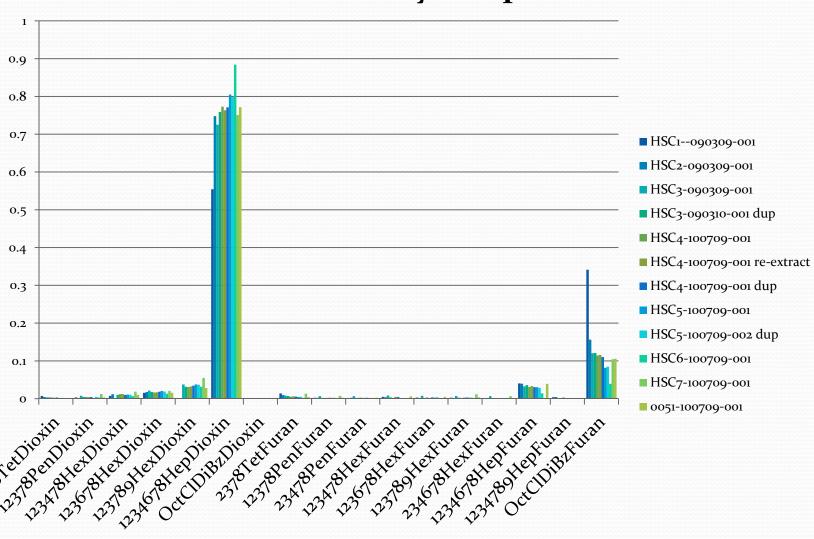
All three side bays have very similar fingerprints

- All three are dominated by OCDF; followed by HpCDDs, TCDFs, HpCDFs and TCDDs.
- Each also has small amounts of other congeners
- It is worth noting that this fingerprint appears similar to upstream HSC (OCDF, HpCDDs, HpCDFs) and San Jacinto (TCDDs & TCDFs) though the upstream HSC signal is more prominent

alveston Bay
TEQs range from 6.4
ppt to less than 1 ppt
Fingerprint similar to
Upstream SJR
background fingerprint
TEQs on the picture
(right) were calculated
using WHO 2005 TEFs



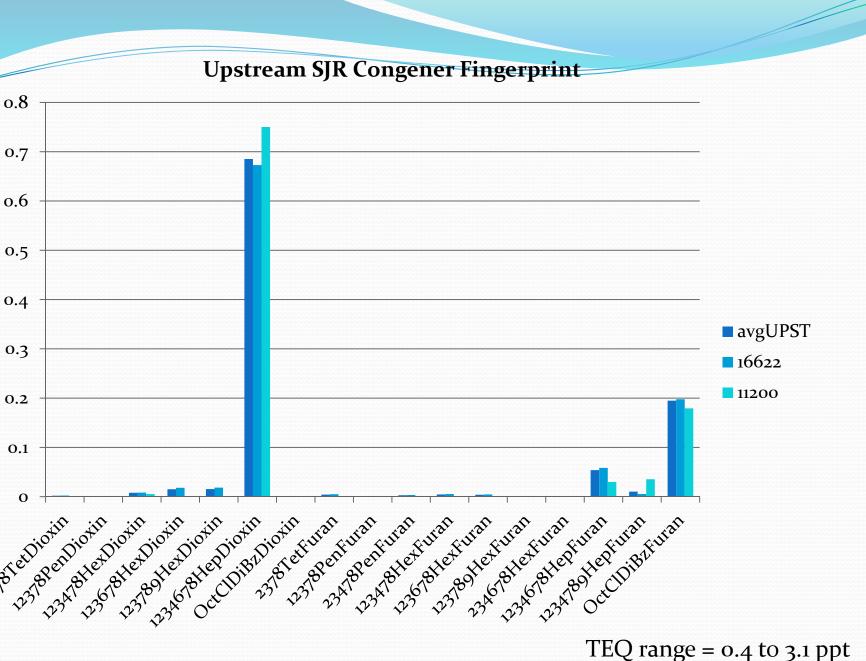
Galveston Bay Samples



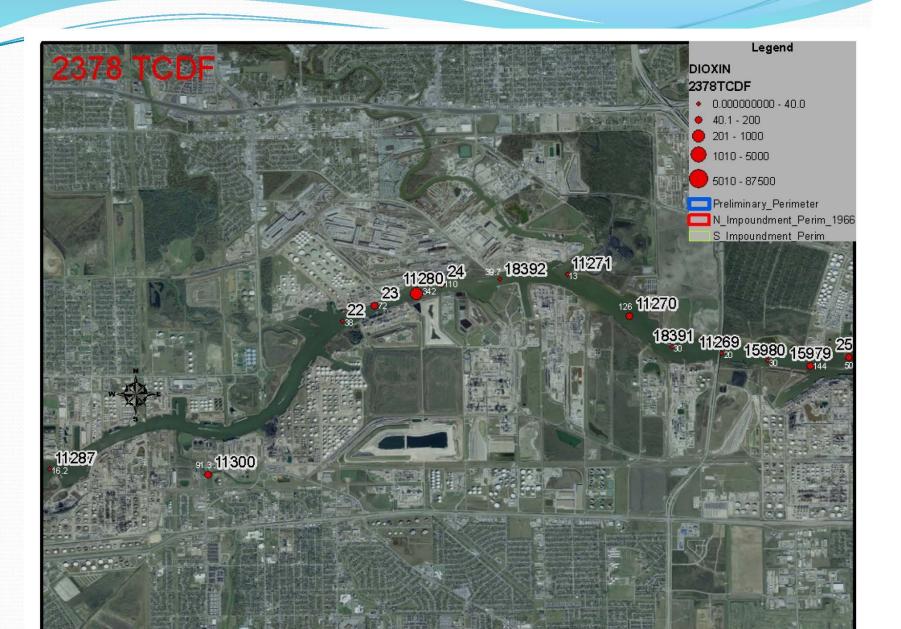
bservations – HSC/Galveston Bay

Fingerprint for all stations dominated by HpCDDs; followed by OCDF, HpCDDs and HpCDFs

- Small amounts of most other congeners
- HSC1 exhibited highest TEQ
- Decreasing TEQ with distance downstream
- Looks much like the upstream SJR samples once you get into Galveston Bay



TEQ range = 0.4 to 3.1 ppt



CDF



